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10/804,830

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Juha Ella

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4955

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WARE FRESSOLA VAN DER SLUYS &  
ADOLPHSON, LLP  
BRADFORD GREEN BUILDING 5  
755 MAIN STREET, P O BOX 224  
MONROE, CT 06468

EXAMINER

SUMMONS, BARBARA

ART UNIT

PAPER NUMBER

2817

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/804,830

Applicant(s)

ELLA ET AL.

Examiner

Barbara Summons

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-17, 19-24 and 26 is/are rejected.
- 7) ☒ Claim(s) 5, 18 and 25 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/14/04</u> . | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities:

On page 6, on line 6, it appears that "proving" should be - - providing - -. On page 6, on line 25, it appears that "first and second delays" should instead be - - phase shifters - - because only the phase shifters have been shown and disclosed as transmission lines or lumped elements (see e.g. page 11, lines 29-31 and claims 10-12), whereas the delay sections are disclosed as layers of dielectric material or as layers of SiO<sub>2</sub> and tungsten (see e.g. page 10, line 31 to page 11, line 1 and claims 17, 18 and 25). Also only the phase shifters provide a "non-acoustic" delay (see e.g. claim 19), whereas the delay sections provide acoustic delays (see e.g. claim 1, lines 18-19). On page 6, on line 26, "lump" should more appropriately be - - lumped - -.

On page 7, on line 8, "proving" should be - - providing - -.

On page 8, on line 2, "second resonant" should be - - second resonant frequency - -. On page 8, on line 27, "proving" should be - - providing - -.

On page 9, on line 5, "lump" should be - - lumped - -.

Appropriate correction is required.

### *Claim Objections*

2. Claims 1, 5, 6, 8, 11-13, 21 and 22 are objected to because of the following informalities:

In claim 1, on the third from last line thereof, "proving" should be - - providing - -.

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In claim 5, on line 2 thereof, "the phase shifter" should be - - the further phase shifter - - (see claims 3 and 4).

Claims 6 and 8 are objected to because they are identical. Are the claim dependencies correct?

In each of claims 11 and 12, on line 2 thereof, "lump" should be - - lumped - -.

In claim 13, on the third from last line thereof, "proving" should be - - providing - -.

In claim 21, on line 2 thereof, "second resonant" should be - - second resonant frequency - -.

In claim 22, on the third from last line thereof, "proving" should be - - providing - -.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 13-16 are rejected under 35 U.S.C. § 102(b) as being anticipated by the Lakin et al. article "High Performance Stacked Crystal Filters for GPS and Wide Bandwidth Applications" (cited by Applicants).

Fig. 8(b) of Lakin et al. discloses a coupled resonator device comprising: an input end (left upper terminal); an output end (right upper terminal) providing filtered signals; a first resonator at the upper left formed by the upper input electrode the ground electrode and the piezoelectric layer therebetween; a first delay section provided by the coupling layers at the left side directly under the first resonator, wherein the acoustic wave signals are inherently delayed the time it takes them to pass through the coupling layers; an intermediate resonator provided by the two cross over electrodes and the piezoelectric layer therebetween, which has a first end at the left side of the figure and a second end at the right side of the figure, wherein the intermediate resonator receives the delayed acoustic signals at the first/left end, then the cross over electrodes produce electric signals to couple to the second/right end, which then generates further acoustic signals; and a second delay section being the coupling layers on the right hand side of the figure that provides further delayed acoustic signals to a second resonator provided by the right side upper electrode connected to the output terminal, the ground electrode and the piezoelectric layer therebetween.

Regarding claim 14, the first and second electrodes are the cross over electrodes. Regarding claim 16, the device includes an acoustic mirror (isolation reflector layers) between the first electrode/lower cross over electrode and the substrate.

5. Claims 13-17 and 21 are rejected under 35 U.S.C. § 102(e) as being anticipated by Lakin U.S. 6,720,844 ('844).

In order to avoid repetition, it should be noted that Fig. 4 of Lakin '844 is substantially the same as Fig. 8(b) of the Lakin et al. article described above, and it anticipates the instant invention of claims 13-16 in the same manner described above. That is, it includes: a substrate 412; a first resonator formed by electrodes 404, 403 and piezoelectric layer 402 connected to input terminals 401, 405; a first delay section formed by layers 450-452 at the left side under the first resonator; an intermediate resonator formed by electrodes 440, 441 and piezoelectric layer 406 having a first end under the first resonator and a second end at the right side of the figure; and a second delay section formed by layers 450-452 at the right side above the second end of the intermediate resonator and under a second resonator formed by electrodes 407, 427 and piezoelectric layer 402 that is connected to output terminals 417 and 430.

Regarding claim 17, the layers 450-452 of the delay sections are dielectric materials (see Fig. 12). Regarding claim 21, the first and second resonators 421 and 424 have slightly different resonant frequencies (see col. 8, lines 43-47).

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-4, 6, 8-12, 19, 20 and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lakin U.S. 6,720,844 in view of Fujita U.S. 6,373,350.

Lakin discloses the coupled resonator filter as discussed above. Additionally, regarding claims 6, 8 and 20, Lakin (Fig. 4) discloses two input and two output terminals, with a single-single (i.e. unbalanced-unbalanced) configuration wherein one of the terminals 405 and 430 of each of the input and output is grounded (see col. 8, line 64 to col. 9, line 3). Regarding claim 9, the resonators are bulk acoustic wave resonators.

However, Lakin does not explicitly disclose the filter used in a duplexer of a transceiver of a mobile communication system with the recited phase shifters. It should be noted that Lakin does disclose its filter constructed for use at two extremely well known mobile communications standard frequencies of 2,140 MHz (Fig. 9) for EGSM and 942.5 MHz (Fig. 10) for WCDMA mode of the UMTS (Universal Mobile Telecommunication System).

Fujita discloses a duplexer in a mobile communication terminal (see col. 1, lines 8-11) that inherently is a transceiver having an antenna and transmitting and receiving circuitry connected to the antenna port 301, transmitting port 306 and receiving port 310 in order for the device to function. The duplexer can have a phase shifter R-LINE (see

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col. 3, lines 60-65 and Fig. 13), being an integrated transmission line, in the receive path and, for higher performance (see col. 4, lines 31-34 and 47-50), the duplexer can have a further phase shifter transmission line T-LINE in the transmit path. Although Fujita discloses its transmit and receive filters as surface acoustic wave (SAW) filters, it should be noted that bulk acoustic wave (BAW) filters are art recognized electrical equivalents of SAW filters in the acoustic resonator filter art.

Consequently, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the filter of Lakin '844 (Fig. 4) by having used it in a duplexer of a mobile communication terminal transceiver with phase shifters as taught by Fujita (Fig. 13), because such an obvious modification would have been merely an extremely well known intended use of such filters as suggested by the exemplary teaching of Fujita, and because the use of phase shifters in both transmitting and receiving branches which would have provided the benefit of higher performance as suggested by Fujita (*ibid.*), and because Lakin also suggests its filter for use at frequencies (Figs. 9 and 10) extremely well known in the mobile communication art, thereby implicitly suggesting their use in duplexers in such mobile terminal transceivers as the ESGM and UMTS standards. Additionally, lumped element and transmission line phase shifters would have been art recognized equivalents (see other art as evidence).

It would have been equally obvious to one of ordinary skill in the art at the time the invention was made to have modified the SAW duplexer of Fujita (Fig. 13) by having replaced the SAW filters 304 and 308 with the coupled resonator filters of Lakin (Fig. 4), because such an obvious modification would have been the mere substitution of art



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recognized alternative electrically equivalent acoustic resonators as would have been known by one of ordinary skill (see also other art of record as evidence) and because BAW resonator filters provide the benefit of a size reduction over SAW resonator filters as also would have been known by one of ordinary skill.

8. Claims 7 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lakin U.S. '844 in view of Fujita U.S. 6,373,350 as applied to claims 1 and 22 above, and further in view of the Lakin et al. article (cited by Applicants).

The Lakin '844/Fujita combination discloses the invention as discussed above.

However, Lakin '844 explicitly discloses only the coupled resonator filter having both the input and output terminals being balanced or both the input and output terminals being unbalanced (single-single)[see col. 8, line 60 to col. 9, line 3].

The article by Lakin discloses that the coupled resonator filter can also be configured to have one of the input and output as an unbalanced terminal and the other of the input and output and a balanced terminal (single-balanced) [see page 4, right column, lines 1-4].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the duplexer of the Lakin '844/Fujita combination such that the terminals of the second coupled resonator device would have been single-balanced and the terminals of the first coupled resonator device would have been single-single, because such an obvious modification was explicitly suggested by the Lakin article (ibid.) and because the configuration of the terminals of the filters would

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have been dependent upon the devices to which they are being connected (e.g. unbalanced/single ended antenna and balanced terminal amplifiers) as would have been known by one of ordinary skill (see other art of record as evidence).

***Allowable Subject Matter***

9. Claims 5, 18 and 25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Weber U.S. 5,864,261 discloses a coupled resonator filter (see Fig. 5) wherein the intermediate resonator 120 is at the top of the device, and the first resonator 100 is acoustically coupled to the intermediate resonator 120 by delay section 150, and the intermediate resonator 120 is acoustically coupled to the second resonator 110 by a second delay section 151.

Bradley et al. U.S. 6,262,637 discloses a BAW duplexer with a phase shifter 134 (Fig. 4), and provides evidence that phase shifters of transmission lines and lumped elements are equivalents (col. 7, lines 5-8) and that duplexers in use are in transceivers, with an antenna and transmit/receive circuits connected to corresponding ports (Fig. 1).

Hikita et al. U.S. 6,714,099 provides evidence that SAW filters and BAW filters are routinely alternatively used in the acoustic filter/duplexer art (see col. 1, lines 7-15),

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and Hikita et al. also provides evidence that it is necessary to have balanced signal connection to a LNA (low noise amplifier Fig. 5) typically in the receiving branch of a duplexer which is the second coupled resonator device in the claims.

Wadaka et al. U.S. 5,789,845 discloses that SAW resonators and BAW resonators are art recognized electrical equivalents (see col. 1, lines 38-41).

Ikata et al. U.S. 5,561,406 shows a duplexer with a phase shifter in both the transmitting and receiving paths and shows two terminals thereto (see Fig. 1).

Stokes et al. U.S. 5,382,930 discloses two stacked bulk acoustic wave filters electrically connected in series (see Figs. 3 and 4).

Ella U.S. 5,910,756 discloses that it is known to use BAW filters in duplexers.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

bs  
June 4, 2005



**BARBARA SUMMONS**  
**PRIMARY EXAMINER**